MCP1602
Evaluation Board
User's Guide

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.

- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.

- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.

- Microchip is willing to work with the customer who is concerned about the integrity of their code.

- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

MCP1602 EVALUATION BOARD USER'S GUIDE

Table of Contents

NOTES:

MCP1602 EVALUATION BOARD USER'S GUIDE

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE on-line help. Select the Help menu, and then Topics to open a list of available on-line help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the MCP1602 Evaluation Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Web Site
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the MCP1602 Evaluation Board as a development tool. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the MCP1602 Evaluation Board.
- **Chapter 2. "Installation and Operation"** – Includes instructions on how to get started with this user's guide and a description of the user's guide.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the MCP1602 Evaluation Board.
- **Appendix B. "Bill Of Materials (BOM)"** – Lists the parts used to build the MCP1602 Evaluation Board.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	`file`.o, where `file` can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options] file [options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

RECOMMENDED READING

This user's guide describes how to use MCP1602 Evaluation Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

MCP1602 Data Sheet, *"2.0 MHz, 500 mA Synchronous Buck Regulator with Power-Good"*, DS22061A

This data sheet provides detailed information regarding the MCP1602 product family.

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: http://support.microchip.com

DOCUMENT REVISION HISTORY

Revision A (November 2007)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The MCP1602 Evaluation Board demonstrates the features and capabilities of Microchip's MCP1602 Evaluation Board 500 mA PFM/PWM Synchronous Buck Regulator. The MCP1602 is a step-down (Buck) switching regulator with a Power-Good monitor to provide a highly integrated solution for systems that require supply voltage between 0.8V to 4.5V. The MCP1602 requires input voltage range from 2.7V to 5.5V. The MCP1602 Evaluation Board includes a MCP1602 circuit that has a Shutdown feature and a 4-position Dip Switch to select between different output voltages. MCP1602 Evaluation Board is available in 0.8V, 1.2V, 1.8V, 2.5V and 3.3V. Additional test points are available on the MCP1602 Evaluation Board for reviewing the performances and features of MCP1602 Evaluation Board.

This chapter covers the following topics:

- What is the MCP1602 Evaluation Board?
- What the MCP1602 Evaluation Board Kit includes
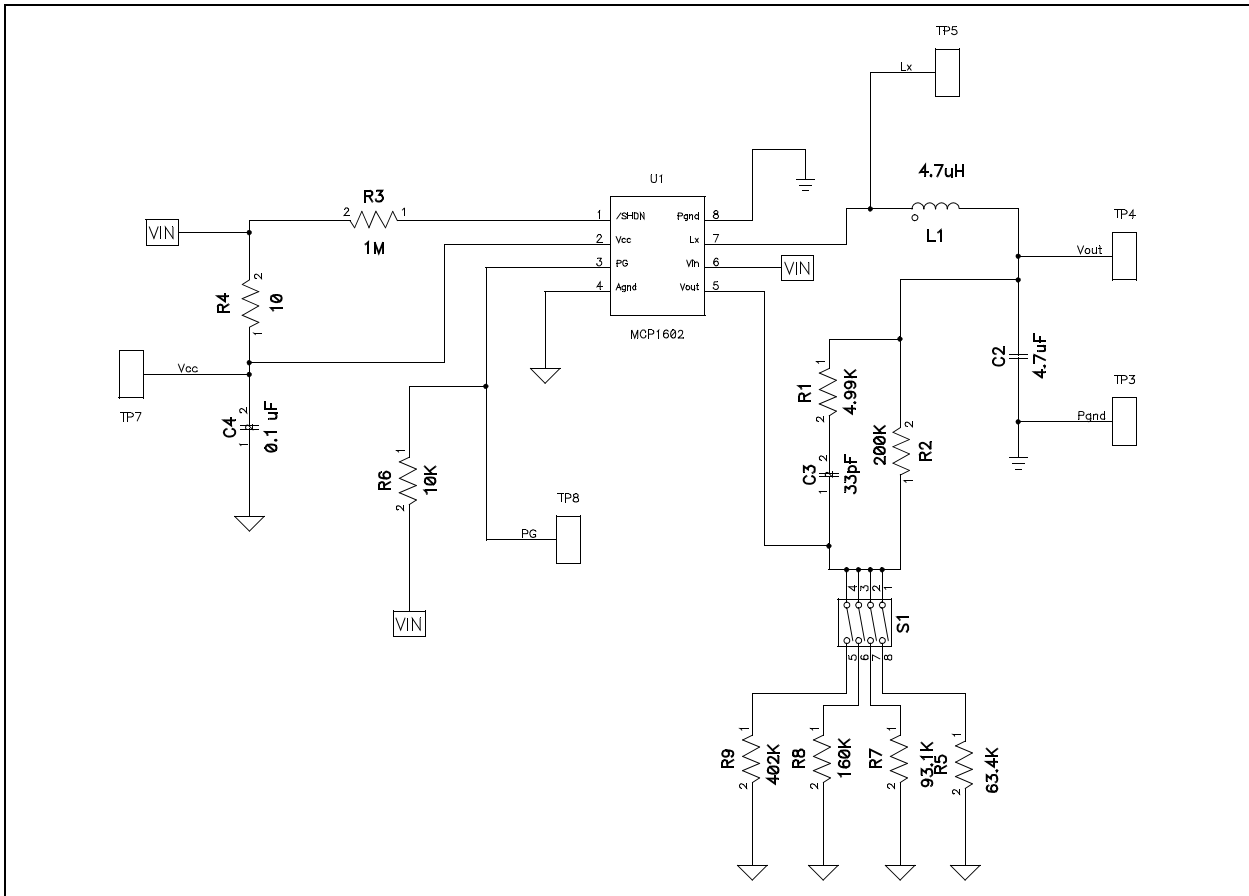
FIGURE 1-1:   *MCP1602 Typical Applications With Adjustable Output Voltage.*

MCP1602 Evaluation Board User's Guide

1.2   WHAT IS THE MCP1602 EVALUATION BOARD?

The MCP1602 Evaluation Board demonstrates the use of PFM/PWM Synchronous Buck Controller that regulates output voltages from 0.8V to 4.5V with Adjustable version or 1.2V, 1.5V, 1.8V, 2.5V and 3.3V with Fixed-Output version.

The MCP1602 Evaluation Board Evaluation Board is setup to evaluate simple DC-to-DC conversion. This board utilizes Microchip's MCP1602 Evaluation Board (PFM/PWM Synchronous Buck Regulator) that effectively steps down from V_{IN} to regulated V_{OUT}. The Power Good function can be observed via the output signal on the PG pin. The MCP1602 on the MCP1602 Evaluation Board is enabled and can be turned off by pulling the $\overline{SHDN}$ pin low.

The MCP1602 Evaluation Board is designed to observe the performance and features on the circuit via multiple test points. Users can also discover the compact size of the layout in addition to the device itself. The circuit can also be implemented into suitable applications without extra work.

1.3   WHAT THE MCP1602 EVALUATION BOARD KIT INCLUDES

This MCP1602 Evaluation Board Kit includes:

• MCP1602 Evaluation Board, 102-00120
• MCP1602 Device with adjustable output voltage (Installed)
• Analog and Interface Products Demonstration Boards CD-ROM (DS21912)
  - MCP1602 Evaluation Board User's Guide, DS51691
  - MCP1602 Evaluation Board Data Sheet, *"2..0 MHz, 500 mA Synchronous Buck Regulator with Power-Good"*, DS22061

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The MCP1602 Evaluation Board demonstrates Microchip's MCP1602 device. This device is a 500 mA, 2.0 MHz PFM/PWM Step-Down DC/DC Regulators With Power-Good feature. It is available in adjustable and fixed outputs.The MCP1602 features Shutdown, Power-Good Monitor, Output Short Circuit Protection and Over-temperature Protection.

The device requires only minimum components to implement a complete Step-Down DC/DC Circuit. The MCP1602 is designed to operate in PFM (Pulse Frequency Modulation) and PWM (Pulse Width Modulation) modes with various load conditions that is ideal for battery-powered portable applications.

The MCP1602 Evaluation Board provides five regulated output voltages for evaluation. Available output voltages are: 0.8V, 1.2V, 1.8V, 2.5V and 3.3V.

Typical applications for the MCP1602 device are: PDAs, Portable Computers, Portable Media Players, USB-Powered Systems, Digital Cameras, Handheld Medical Instruments, Ultra-Mobile PCs and Portable Communicators.

2.2 FEATURES

The MCP1602 Evaluation Board has the following features:

- Adjustable Output Voltages: 0.8V, 1.2V, 1.8V, 2.5V and 3.3V
- Input Voltage Range: 2.7V to 5.5V
- Shutdown Test Point
- Power-Good Test Point
- Easy V_{OUT} setup with Slide Style Dip Switch
- L_X Test Point for switching behavior observation.

2.3   GETTING STARTED

The MCP1602 Evaluation Board is fully assembled and tested for generating a regulated 0.8V, 1.2V, 1.8V, 2.5V and 3.3V output voltage from the MCP1602 device with a 2.7V to 5.5V input voltage source for $V_{IN} > V_{OUT}$.

2.3.1   Power Input and Output Connection

2.3.1.1   POWERING THE MCP1602 EVALUATION BOARD

1. Connect the negative terminal of the DC power supply to P_{GND}.
2. Connect the positive terminal of the DC power supply to V_{IN}.
3. Connect the positive terminal of the multimeter to V_{OUT} and the negative terminal to P_{GND}. The multimeter should display a regulated output voltage.
4. Adjust the DIP Switch to the desired value and the multimeter should read the desired output voltage. Refer to Table 2-1 for the voltage regulation.

Note: The number labels on the DIP SWITCH may have slightly different way to demonstrate the mark, but will not affect the performance of the board.

5. The $\overline{SHDN}$ pin defaults to the enabled position on the MCP1602 Evaluation Board. To enter the shutdown mode, drive the $\overline{SHDN}$ pin low.
6. The L_X pin is available to observe the switching waveforms. By adjusting a variable load that is connected to V_{OUT}, the transitions between PFM/PWM can be easily observed.
7. The PG pin is available to monitor the Power-Good signal.
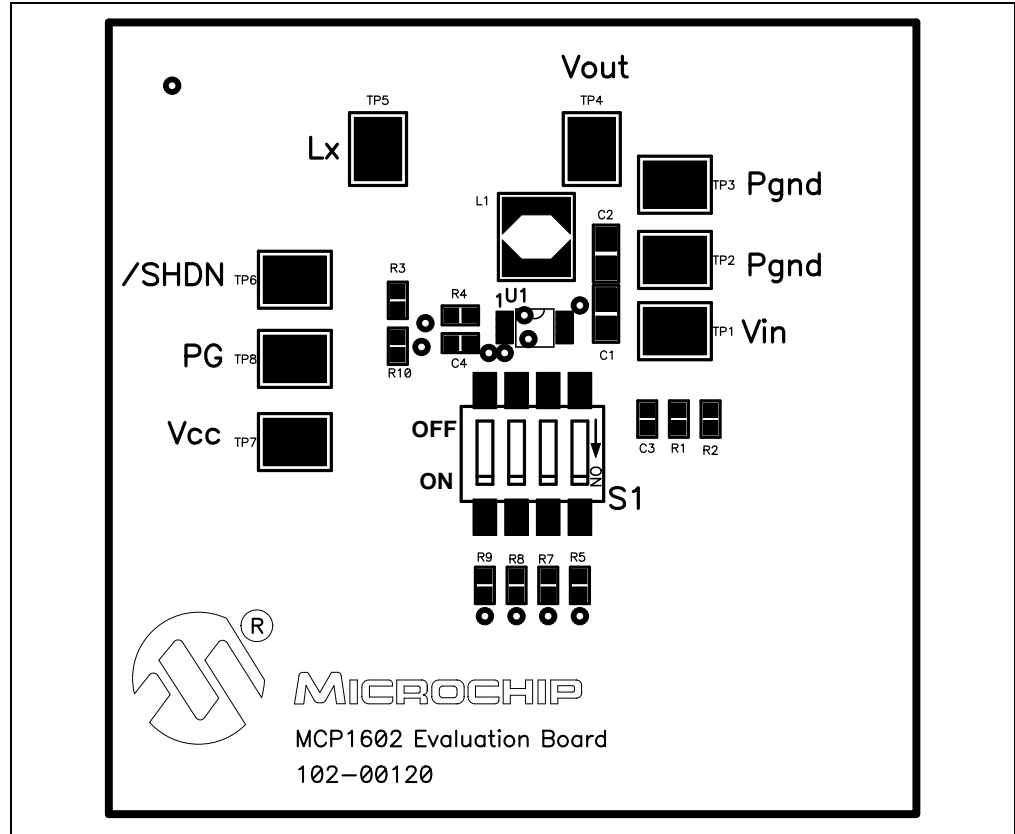
FIGURE 2-1: *Board Top Assembly.*

TABLE 2-1: OUTPUT VOLTAGE REGULATION DIP POSITION

Voltage (V)	1	2	3	4
0.8V	OFF	OFF	OFF	OFF
1.2V	ON	OFF	OFF	OFF
1.8V	OFF	ON	OFF	OFF
2.5V	OFF	OFF	ON	OFF
3.3V	OFF	OFF	OFF	ON

MCP1602 Evaluation Board User's Guide

NOTES:

Appendix A. Schematic and Layouts

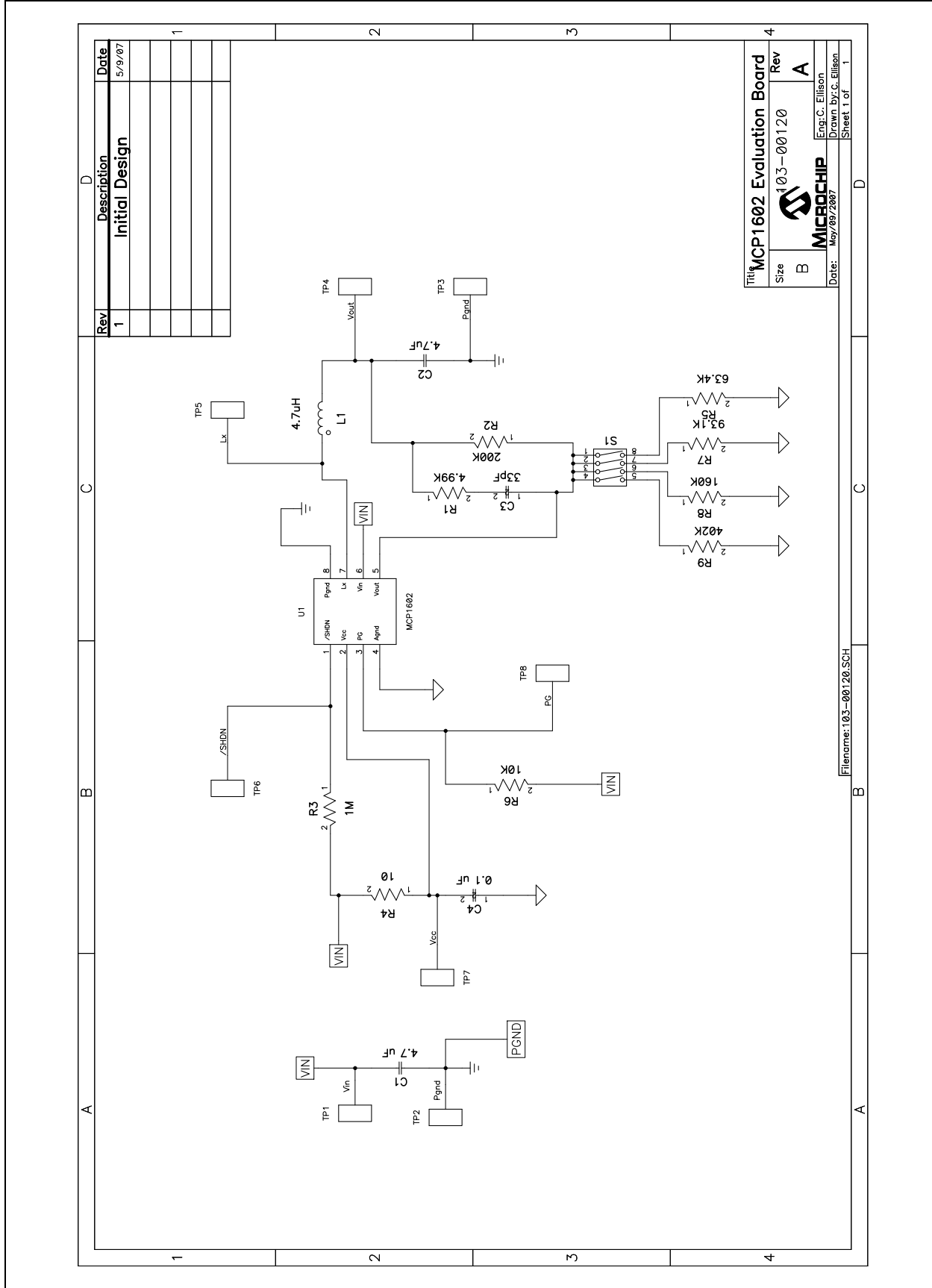## A.1 INTRODUCTION

This appendix contains the following schematics and layouts for the MCP1602 Evaluation Board:

- Board – Schematic Sheet
- Board – Top Layer
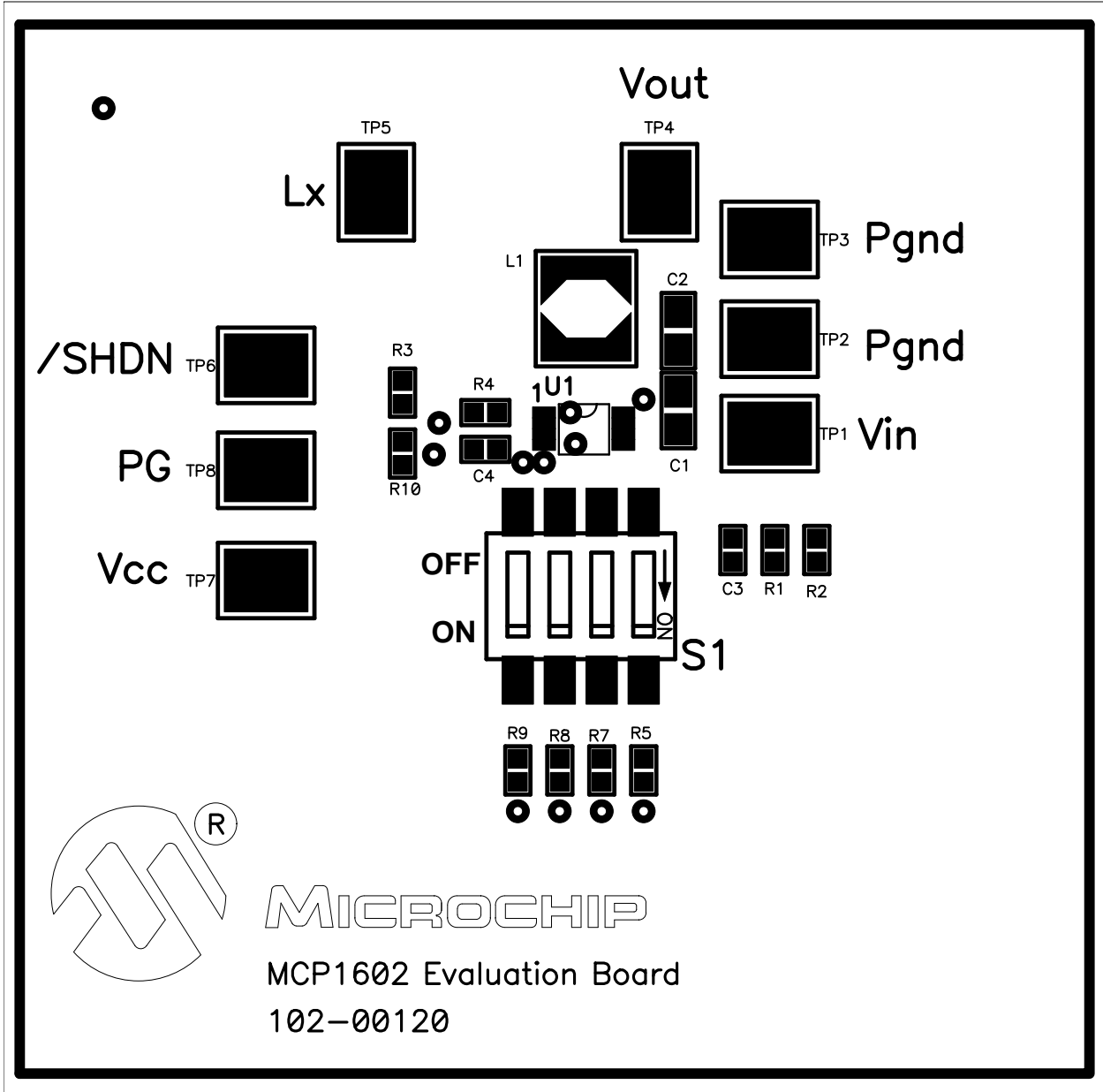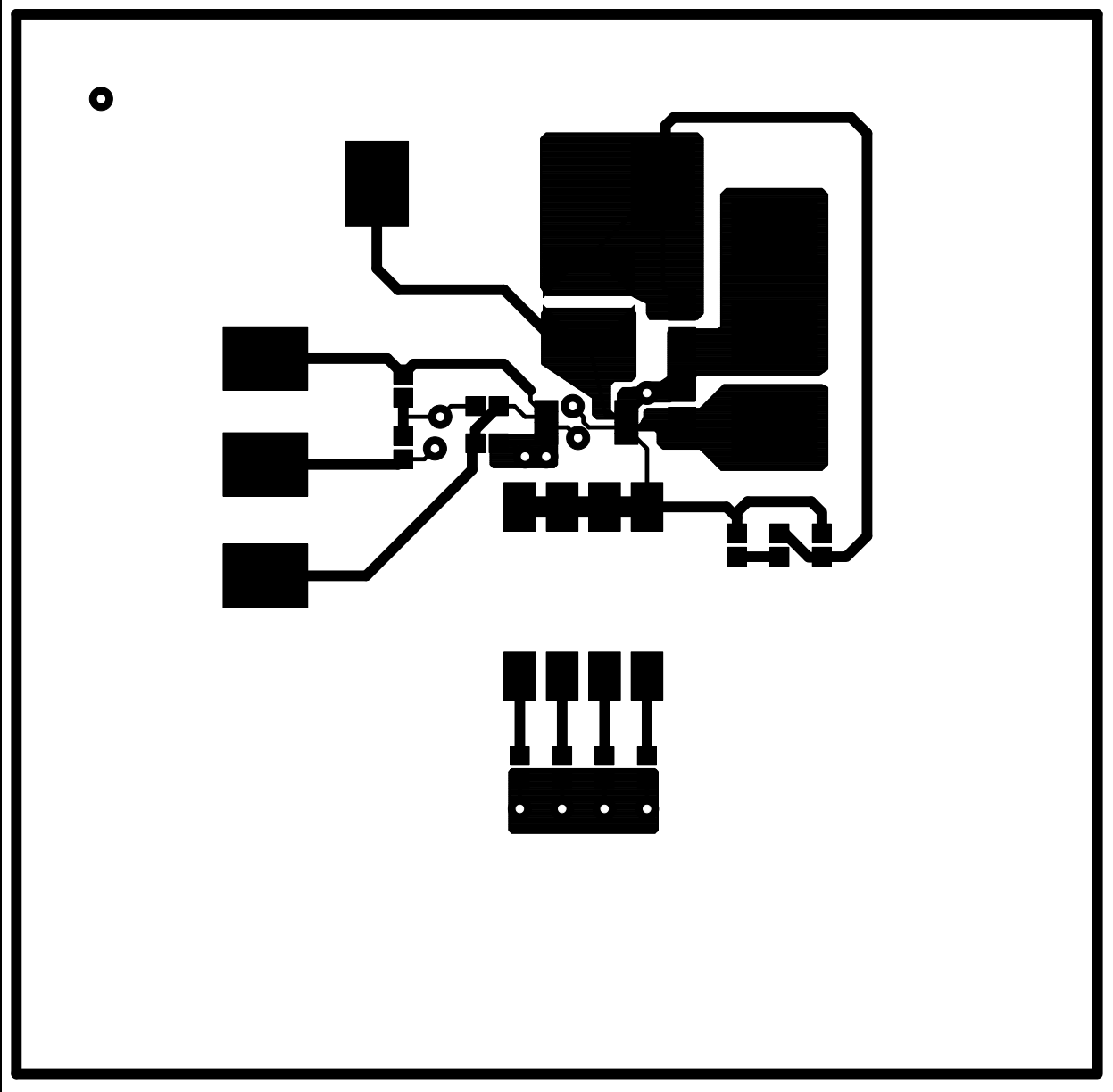- Board – Top Metal Layer
- Board – Bottom Layer

A.2 BOARD – SCHEMATIC

A.3   BOARD – TOP LAYER

MCP1602 Evaluation Board User's Guide

A.4   BOARD – TOP METAL LAYER

A.5 BOARD – BOTTOM LAYER

104-00120 REV 1

NOTES:

Appendix B. Bill Of Materials (BOM)

TABLE B-1:   BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
2	C1, C2	CAP CERAMIC 4.7 μF 16V X5R 0805	Panasonic® - ECG	ECJ-2FB1C475K
1	C3	CAP CERAMIC 33 pF 25V NP0 0201	Panasonic - ECG	ECJ-ZEC1E330J
1	C4	CAP CERAMIC .1 μF 16V X7R 0603	Panasonic - ECG	ECJ-1VB1C104K
1	R1	RES 4.99K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF4991V
1	R2	RES 200K OHM 1/10W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ204V
1	R3	RES 1.00M OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1004V
1	R4	RES 10.0 OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF10R0V
1	R5	RES 63.4K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF6342V
1	R6	RES 10.0K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1002V
1	R7	RES 93.1K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF9312V
1	R8	RES 160K OHM 1/10W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ164V
1	R9	RES 402K OHM 1/10W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF4023V
1	S1	SWITCH DIP SPST SEALED 4POS SMD	Copal Electronics Inc	SD04H1SB
1	L1	INDUCTOR POWER SHIELD 4.7μH SMD	Coiltronics	SD18-4R7-R
8	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8	PC Test Point Compact SMT	Keystone Electronics®	5016
1	U1	500 mA PFM/PWM Synchronous Buck Regulator	Microchip Technology, Inc	MCP1602-ADJI/MF
1	---	Printed Circuit Board	—	104-00120-R1

Note 1:   The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

WORLDWIDE SALES AND SERVICE

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://support.microchip.com
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

Kokomo
Kokomo, IN
Tel: 765-864-8360
Fax: 765-864-8387

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608

Santa Clara
Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto
Mississauga, Ontario,
Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8528-2100
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Fuzhou
Tel: 86-591-8750-3506
Fax: 86-591-8750-3521

China - Hong Kong SAR
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Shunde
Tel: 86-757-2839-5507
Fax: 86-757-2839-5571

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-4182-8400
Fax: 91-80-4182-8422

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Yokohama
Tel: 81-45-471- 6166
Fax: 81-45-471-6122

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-572-9526
Fax: 886-3-572-6459

Taiwan - Kaohsiung
Tel: 886-7-536-4818
Fax: 886-7-536-4803

Taiwan - Taipei
Tel: 886-2-2500-6610
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

UK - Wokingham
Tel: 44-118-921-5869
Fax: 44-118-921-5820

10/05/07

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Power Management IC Development Tools *category:*

Click to view products by Microchip *manufacturer:*

Other Similar products are found below :

EVB-EP5348UI MIC23451-AAAYFL EV MIC5281YMME EV 124352-HMC860LP3E DA9063-EVAL ADP122-3.3-EVALZ ADP130-0.8-EVALZ ADP130-1.8-EVALZ ADP1740-1.5-EVALZ ADP1870-0.3-EVALZ ADP1874-0.3-EVALZ ADP199CB-EVALZ ADP2102-1.25-EVALZ ADP2102-1.875EVALZ ADP2102-1.8-EVALZ ADP2102-2-EVALZ ADP2102-3-EVALZ ADP2102-4-EVALZ AS3606-DB BQ25010EVM BQ3055EVM ISLUSBI2CKIT1Z LP38512TS-1.8EV EVAL-ADM1186-1MBZ EVAL-ADM1186-2MBZ ADP122UJZ-REDYKIT ADP166Z-REDYKIT ADP170-1.8-EVALZ ADP171-EVALZ ADP1853-EVALZ ADP1873-0.3-EVALZ ADP198CP-EVALZ ADP2102-1.0-EVALZ ADP2102-1-EVALZ ADP2107-1.8-EVALZ ADP5020CP-EVALZ CC-ACC-DBMX-51 ATPL230A-EK MIC23250-S4YMT EV MIC26603YJL EV MIC33050-SYHL EV TPS60100EVM-131 TPS65010EVM-230 TPS71933-28EVM-213 TPS72728YFFEVM-407 TPS79318YEQEVM UCC28810EVM-002 XILINXPWR-083 LMR22007YMINI-EVM LP38501ATJ-EV